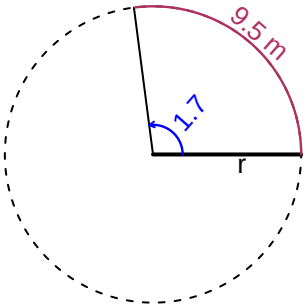
Name: Date:

Trig Final (SLTN v640)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 1.7 radians. The arc length is 9.5 meters. How long is the radius in meters?

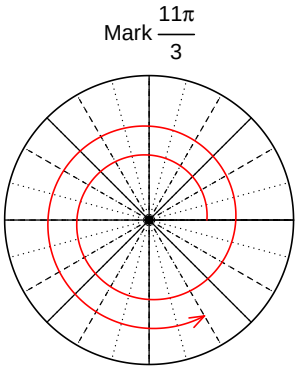


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

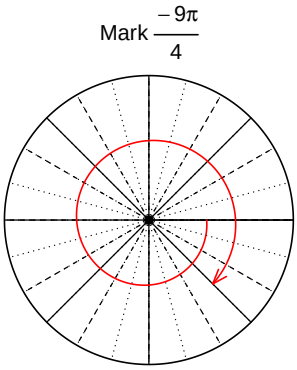
$r = 5.588$ meters.

Question 2

Consider angles $\frac{11\pi}{3}$ and $\frac{-9\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{11\pi}{3}\right)$ and $\sin\left(\frac{-9\pi}{4}\right)$ by using a unit circle (provided separately).



Find $\cos(11\pi/3)$



Find $\sin(-9\pi/4)$

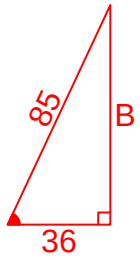
$\cos(11\pi/3) = \frac{1}{2}$

$\sin(-9\pi/4) = \frac{-\sqrt{2}}{2}$

Question 3

If $\cos(\theta) = \frac{36}{85}$, and θ is in quadrant IV, determine an exact value for $\tan(\theta)$.

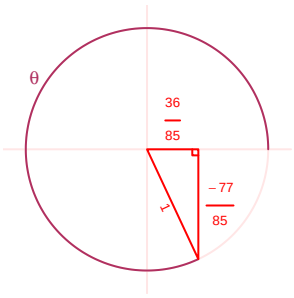
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$36^2 + B^2 = 85^2$$
$$B = \sqrt{85^2 - 36^2}$$
$$B = 77$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.



$$\tan(\theta) = \frac{\frac{-77}{85}}{\frac{36}{85}} = \frac{-77}{36}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 8.31 Hz, a midline at $y = -7.11$ meters, and an amplitude of 3.45 meters. At $t = 0$, the mass is at the midline and moving up. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 3.45\sin(2\pi 8.31t) - 7.11$$

or

$$y = 3.45\sin(16.62\pi t) - 7.11$$

or

$$y = 3.45\sin(52.21t) - 7.11$$